REMARKS

Claims 1-70 remain in this application, with Claims 1, 2-4, 7, 9-12, 20-21, and 26-27 amended. By these amendments, no new matter has been added. Claim 1 is believed to be allowable and generic to all of Claims 22-24, 28-37, 42-47 and 65-70 that were withdrawn by the Examiner, and that depend from Claim 1. These withdrawn claims accordingly remain in this application for further consideration in the event that Claim 1 is found to be allowable.

The claims have been amended to more particularly point out and distinctly claim the invention. In particular, Claim 1 has been amended to more explicitly set forth the structure that is present in a beam that is contoured across its width as shown, for example, in Figs. 1A, 5A, 5B and 6. The remaining claims have been amended to correct certain informalities, and for consistency with Claim 1.

With respect to the amendment of Claim 1, it should be understood that a beam that is flat (uncontoured) across its width, such as shown in Fig. 5C, will not have a cross section that extends from the neutral axis of the beam for greater than one-half of the cross-sectional thickness. In contrast, a beam that is contoured across its width will of necessity extend further than one-half of the thickness from the neutral axis, as shown, for example, in Figs. 5A, 5B, and 5D, and thereby stiffen the beam. Clearly, Fig. 3 of Grabbe, which was referenced by the Examiner to show widthwise contouring, does not show widthwise contouring in the sense defined by Claim 1. In other words, a cross-section taken across the width of beam 22 shown in Fig. 3 of Grabbe would be flat between the beam edges, while Claim 1 defines a cross section that is not flat.

In general, the present invention is directed towards novel microelectronic spring structures that can be produced using a novel method for forming microelectronic springs, which method is the subject of co-pending applications Serial Nos. 09/795,772 and 09/781,833. Prior art methods for forming microelectronic springs such as disclosed in the Grabbe and Babuka references cited by the Examiner were not well

suited for forming structures having the novel features of the invention. Contouring individual beams across their width would be difficult or infeasible when the beam is formed by bending a metal sheet as taught by Babuka and Grabbe. If greater stiffness was desired in a spring contact made by sheet bending and cutting method, a thicker sheet could merely be used as the base material. It would likely be much more costly to attempt to stiffen the contacts by attempting to bend the relatively narrow beam of each sheet metal contact across its width. In addition, widthwise contouring is not possible using lithographic techniques either, unless the sacrificial layers are specially formed (such as by molding) using the novel methods disclosed in the specification and which are the subject of the co-pending applications referenced above.

Moreover, although the size or space of the contact structures is not a limitation of the invention, it should be understood that cited prior art spring forming methods were not contemplated for forming springs below about 1 mm pitch (see, e.g., Grabbe at col. 2, lines 11-12), while the springs of the present invention may be disposed at pitches of 0.1 mm or less. At these smaller pitches, sheet-bending techniques are not feasible, and lithographic methods are used instead. The stiffening effect provided by the widthwise contouring of the present invention accordingly provides a substantial benefit for springs made using lithographic techniques, by reducing the amount of material required for the beam, thereby reducing the required cycle time for plating or other deposition techniques.

The Examiner rejected Claims 3-4 and 26-27 under 35 U.S.C. § 112, second paragraph. This rejection is respectfully traversed. Claims 3-4 and 26-27 have been amended to correct the informalities noted by the Examiner, and are believed to be sufficiently definite. These rejections should therefore be withdrawn.

The Examiner rejected Claims 1-2, 9, 13, 18-20, 25, 38-41, 48 and 56-59 under 35 U.S.C. 102(b) as being anticipated by Grabbe. This rejection is respectfully traversed. As noted above, Grabbe discloses a sheet metal spring contact, having a beam that is flat. While Fig. 3 of Grabbe shows a contact having a beam that appears

to be slightly twisted along its length, the beam is not contoured across its width. More exactly, Grabbe fails to disclose a spring contact having a beam "wherein said beam has a length running between said base and said tip, a substantially uniform thickness, and a width between a first edge and a second edge of said beam, and wherein every cross-section of said beam taken across said width for at least a portion of said unsupported span extends from a neutral axis of said every cross-section for a distance substantially greater than one-half of the substantially uniform thickness of said beam, said neutral axis running through said first edge, said second edge, and a centroid of said every cross-section," as defined by Claim 1. Failing to disclose every element of Claim 1, Grabbe accordingly does not anticipate Claim 1 or any of its dependent Claims 2, 9, 13, 18-20, 25, 38-41, 48 and 56-59. These rejections should therefore be withdrawn.

The Examiner rejected Claims 3-8, 10-12, 14-17, 22-24, 26-37, 42-47, 49-55, 60-64 under 35 U.S.C. § 103(a) as being unpatentable over Grabbe. This rejection is respectfully traversed. Grabbe fails to disclose or suggest a spring contact having a contoured (non-flat) cross-sectional shape from edge-to-edge of the beam across a substantial part of its span, as defined by Claim 1. All of the rejected claims depend from Claim 1. These rejections should therefore be withdrawn.

The Examiner rejected Claim 21 under 35 U.S.C. § 103(a) as being unpatentable over Grabbe in view of Babuka. Babuka (Fig. 2) shows a spring contact that is V-shaped in a cross-section taken along the length of the beam from base to tip. Babuka does not make up for the deficiencies of Grabbe, failing to disclose or suggest anything other than a flat shape in cross-sections taken across the width of the beam. It should also be noted that the V-shape disclosed by Babuka would not stiffen the beam; if anything, it would make it less stiff as compared to a beam of equivalent length. This rejection should therefore be withdrawn.

In view of the foregoing, the Applicants respectfully submit that Claims 1-70 are in condition for allowance. Reconsideration and withdrawal of the rejections is

respectfully requested, and a timely Notice of Allowability is solicited.

To the extent it would be helpful to placing this application in condition for allowance, the Applicants encourage the Examiner to contact the undersigned counsel and conduct a telephonic interview.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

While the Applicants believe that no fees are due in connection with the filing of this paper, the Commissioner is authorized to charge any shortage in the fees, including extension of time fees, to Deposit Account No. 50-0639.

Respectfully submitted,

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Brian M. Berliner
Attorney for Applicants
Registration No. 34,549

O'MELVENY & MYERS LLP
400 South Hope Street
Los Angeles, CA 90071-2899
Telephone: (213) 430-6000

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1, 2-4, 7, 9-12, 20-21, and 26-27 have been amended as follows:

1. (Amended) A microelectronic spring structure, comprising:

a base formed of a resilient material;

a beam formed integrally with said base of said resilient material, and connected to said base at a first end of said beam; and

a tip positioned at a second end of said beam opposite to said base;

wherein said beam has an unsupported span between said tip and said base and wherein said beam has a length running between said base and said tip, a substantially uniform thickness, and a width between a first edge and a second edge of said beam, and wherein every cross-section of said beam taken across said width for at least a portion of said unsupported span extends from a neutral axis of said every cross-section for a distance substantially greater than one-half of the substantially uniform thickness of said beam, said neutral axis running through said first edge, said second edge, and a centroid of said every cross-section.

2. (Amended) The microelectronic spring structure of Claim 1, further comprising a substrate attached at a substrate surface thereof to said base.

3. (Amended) The microelectronic spring structure of Claim 2, wherein said tip has an unloaded height over [the plane of] said substrate surface in the range of 1 to 5 mils.

4. (Amended) The microelectronic spring structure of Claim 3, wherein said tip has an unloaded height over [the plane of] said substrate surface less than about 2 mils.

7. (Amended) The microelectronic spring structure of Claim 6, wherein said beam has a width less than about 1 [mils] mil.

9. (Amended) The microelectronic spring structure of Claim 1, wherein said beam has a substantially uniform thickness in a direction perpendicular to the substrate.

10. (Amended) The microelectronic spring structure of Claim 1, wherein said beam has a substantially uniform thickness in the range of about 0.4 to 20 mils.

11. (Amended) The microelectronic spring structure of Claim 1, wherein said beam has a substantially uniform thickness less than 0.4 mils.

12. (Amended) The microelectronic spring structure of Claim [11] 1, wherein said beam, as measured at [any representative] said every cross-section [taken across a width of said beam along at least a portion of the length of said beam,] has an area moment of inertia substantially greater than said width at said every cross-section multiplied by the cube of said substantially uniform thickness, divided by twelve.

20. (Amended) The microelectronic spring structure of Claim 1, wherein every cross-section of said unsupported span taken across said width of said beam at every location along said length of said beam [is contoured in a widthwise direction] extends from a neutral bending axis of said every cross-section for a distance substantially greater than one-half of said substantially uniform thickness of said beam.

21. (Amended) The microelectronic spring structure of Claim 1, wherein said [beam] every cross-section is generally V-shaped [in cross-section].

26. (Amended) The microelectronic spring structure of Claim [26] 25, wherein said stepped portion of said beam has a step height in the range about 5% to 20% of an unloaded height of said tip over said substrate surface.

27. (Amended) The microelectronic spring structure of Claim [26] 25, wherein said stepped portion of said body portion has a step height about 10% of an unloaded height of said tip over said substrate surface.